



Second Five-Year Review Report

for  
Folkertsma Refuse Site  
City of Walker  
Kent County, Michigan

February 2004

PREPARED BY:

U. S. EPA - REGION 5

Approved by:

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2-12-04

Date

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## **List of Acronyms**

ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
EPA	United States Environmental Protection Agency
FSR	Final Site Remedy
HRL	Health Risk Limit
GCL	Geosynthetic Clay Liner
GWOU	Groundwater Operable Unit
MCL	Maximum Contaminate Limit
MDPH	Michigan Department of Public Health
MDEQ	Michigan Department of Environmental Quality
NPDES	National Pollutant Discharge Elimination
NPL	National Priority List
NOC	Notice of Compliance
O & M	Operation and Maintenance
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCOR	Preliminary Close Out Report
PRP	Potentially Responsible Party
PSFD	Pilot Scale Field Demonstration
RA	Remedial Action

RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SCOU	Source Control Operable Unit
VOCs	Volatile Organic Compounds

## Executive Summary

The selected remedy for the Folkertsma Refuse Site included the following major components:

- Excavation of contaminated sediments from the two on-site ditches and Indian Mill Creek for consolidation with the landfilled materials;
- Conversion of the two on-site ditches into permeable underground drains to provide for continued site drainage;
- Construction of a cap over contaminated sediments and landfilled materials in accordance with the requirements of the Resource Conservation and Recovery Act Subtitle D and Michigan Solid Waste Management Act 641;
- Installation of passive gas vents to prevent the buildup of volatile organic compounds and methane, if necessary;
- Placement of a layer of topsoil and a vegetative covering over the clay cap and landfilled materials;
- Site fencing and institutional controls such as deed restrictions to prevent the installation of drinking water wells within the landfilled portion of the site and future disturbance of the cap and landfilled materials;
- Implementation of long-term groundwater and drainage water monitoring programs to ensure the effectiveness of the remedial action.

The remedy selected for the Folkertsma Refuse site has eliminated and reduced the risks posed by the site through the use of engineering and institutional controls. The selected remedy provided for the containment of a large volume of low level organic and inorganic waste material, decaying matter, muck and the contaminated sediments removed and deposited on the landfill from the two on-site ditches and Indian Mill Creek.

The Site achieved construction completion with the signing of the Preliminary Close Out Report on September 15, 1994. The trigger for this five-year review was the actual completion of the first five-year review on February 17, 1999.

## Five-Year Review Summary Form

### SITE IDENTIFICATION

**Site name (from WasteLAN):** Folkertsma Refuse

**EPA ID (from WasteLAN):** MID980609366

**Region:** 5

**State:** MI

**City/County:** Walker/Kent County

### SITE STATUS

**NPL status:** Final ☒ Deleted Other (specify) \_\_\_\_\_

**Remediation status** (choose all that apply): ☐ Under Construction ☐ Operating ☒ Complete

**Multiple OUs?\*** YES ☒ NO

**Construction completion date:** 09/15/1994

**Has site been put into reuse?** ☐ YES ☒ NO

### REVIEW STATUS

**Lead agency:** ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency \_\_\_\_\_

**Author name:** Gladys Beard

**Author title:** NPL State Deletion Process Manager

**Author affiliation:** U. S. EPA, Region 5

**Review period:\*\*** 01 /01 /2003 to 02 /01 / 2004

**Date(s) of site inspection:** 10 /16 /2003

**Type of review:**

- ☒ Post-SARA    ☐ Pre-SARA    ☐ NPL-Removal only  
☐ Non-NPL Remedial Action Site    ☐ NPL State/Tribe-lead  
☐ Regional Discretion

**Review number:** ☐ (first) ☒ (second) ☐ 3 (third) ☐ Other (specify) \_\_\_\_\_

**Triggering action:**

- ☐ Actual RA Onsite Construction at OU # \_\_\_\_\_    ☐ Actual RA Start at OU# \_\_\_\_\_  
☐ Construction Completion    ☒ Previous Five-Year Review Report  
☐ Other (specify) \_\_\_\_\_

**Triggering action date (from WasteLAN):** 02 /17/1999

**Due date (five years after triggering action date):** 02 /17 /2004

\* ["OU" refers to operable unit.]

\*\* [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]



## **FIVE-YEAR REVIEW SUMMARY FORM, cont'd**

### **Issues:**

Continue with routine site maintenance including annual mowing of the vegetative cover, site inspections of site and integrity of the cover. Continue with groundwater, surface water sampling program and a gas sampling/monitoring program.

### **Recommendation and Follow-up Actions:**

The U.S. EPA recommends that the site be put into reuse. The PRPs would like to cover a portion of the site with asphalt so they can use this portion for the storage of pallets. They would cover a portion of the site with asphalt and use it as a storage space provided that the construction specifications included a weight test so the storage will not affect the present cover so the present cover can remain protective of human health and the environment. When US EPA and the MDEQ receive the PRP's proposal and evaluate the proposal a decision for reuse of the portion of the site will be made. It is recommended to continue maintenance of the clay cap, the vegetative covering and the drainage systems. It is also recommended that site inspections be conducted by U.S. EPA or the MDEQ every 1-2 years to verify site conditions and to ensure that any maintenance tasks are identified and implemented.

All monitoring of groundwater and surface water and landfill gas will continue at the site. It is recommended that one of the gas probes GP-3, be abandoned and sealed. All other gas probes, monitoring wells be labeled with aluminum signs.

### **Protectiveness Statement(s):**

All immediate threats at the site have been addressed, and the remedy is protective in the short-term of human health and the environment.

### **Long-Term Protectiveness:**

Long-term protectiveness at the Folkertsma Refuse Superfund Site (the Site) will be achieved by continuing the maintenance of the clay cap, long-term monitoring of the ground water, surface water and gas venting system. Long-term groundwater monitoring has demonstrated that the concentrations of the chemicals of concern have declined close to or below cleanup goals.

### **Other Comments:**

None.

**Folkertsma Refuse Site  
Walker, Michigan  
Second Five-Year Review Report**

**I. Introduction**

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Michigan Department of Environmental Quality (MDEQ) and the United States Environmental Protection Agency (EPA), Region 5, conducted the five-year review of the remedy implemented at the Site. This review was conducted by the Project Managers for the entire site from January 2001 through December 2003. This report documents the results of the review.

This is the second five-year review for the Site. The triggering action for this five-year review is the completion of the first Five Year Review on February 17, 1999. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

## II. Site Chronology

**Table 1: Chronology of Site Events**

<b>Event</b>	<b>Date</b>
Removal Assessment	<b>6/15/92</b>
Proposal to the NPL	<b>6/10/86</b>
NPL listing	<b>3/31/89</b>
PRP Search	<b>2/15/86</b>
RI/FS complete	<b>6/28/91</b>
ROD signature	<b>6/18/91</b>
Consent Decree	<b>8/03/92</b>
Remedial design start	<b>5/29/92</b>
Remedial design start	<b>8/31/91</b>
Remedial design complete	<b>9/30/93</b>
Actual remedial action start	<b>9/30/93</b>
Preliminary Close Out Report	<b>9/15/94</b>
Deletion from NPL	<b>4/10/96</b>
Previous five-year review	<b>2/17/99</b>

### **III. Background**

#### **Physical Characteristics**

Prior to 1965, the Folkertsma Refuse site was operated as a muck farm. In 1965, the owners/operators began to accept industrial waste for disposal in a landfill operated on the southern two-thirds of the property. Disposal activities ceased in 1972 and the property was occupied by a pallet repair and manufacturing company soon after.

#### **Land and Resource Use**

The Folkertsma Refuse site is a former industrial landfill located at 1426 Pannell Road, N.W. in Walker, Michigan. The City of Walker, which borders the northwest side of Grand Rapids, is located in southwestern Michigan, approximately 45 miles east of Lake Michigan in Kent County.

The site is a rectangular parcel of land measuring 1,000 by 400 feet and covering approximately 8 acres. The site is generally flat with 10 feet of vertical relief sloping from the northern boundary to the southern boundary. The surface of the landfilled portion of the site rises approximately 4 to 6 feet above the surrounding area. The landfill was not capped and foundry sand, the primary fill material, was exposed at the surface. However, the northeast portion of the site has been covered with a 3-inch layer of gravel. An unnamed creek (manmade) running along the western property line and a drainage ditch running through the center of the landfill join at the southern end of the site and empty into a drain pipe. The drain pipe discharges to Indian Mill Creek just south of the site. Fishing and swimming have been reported to occur in Indian Mill Creek. However, Indian Mill Creek is not a major recreational area. Indian Mill Creek, which flows in an easterly direction, empties into the Grand River approximately 2 miles downstream of the site.

The property is currently leased by a pallet repair and manufacturing company. An office building and three warehouses are located on the site, and stacks of pallets are organized along the graveled area. The remainder of the site is overgrown with weeds, grass and trees and contains several pieces of junk machinery.

The site and the properties surrounding the site are zoned for and occupied by industry. There are, however, about ten to twelve residences along the south side of Pannell Road in close proximity to the north end of the site. These homes obtain water from private wells, which are upgradient from the site. There is also a residential subdivision approximately a quarter of a mile north of the site. The subdivision, also upgradient of the site, is serviced by the Grand Rapids Water Department, which obtains its water from Lake Michigan and the Grand River. Residences also exist south of the site, on the other side of Indian Mill Creek. These homes are downgradient of the site. Michigan Department of Natural Resources well records indicate that there is only one domestic well in this area; the other residences are serviced by the Grand Rapids

Water Department. A door to door survey conducted in 1986 did not identify any additional water wells in this area.

East of the site is a tract of undeveloped woodland which was formerly operated as a muck farm, and the western boundary is bordered by nursery land and greenhouses. South of the site is a transfer station for a rendering company. Wetlands exist along a second drainage ditch approximately 85 feet east of the site, and in scattered areas along the north bank of Indian Mill Creek downstream from the site.

### **History of Contamination**

As required by CERCLA, the United States Environmental Protection Agency (EPA) was notified of past waste disposal activities at the Folkertsma Refuse site in 1981. A preliminary assessment was completed in 1983. It was determined that an on-site investigation should be conducted. In 1984, an EPA field investigation team sampled groundwater and the sediment of the drainage ditch. Although the groundwater was not found to be contaminated, elevated levels of semi-volatile and inorganic chemicals were detected in the sediment samples. In 1985, the Michigan Department of Natural Resources (now known as the Michigan Department of Environmental Quality or MDEQ) conducted an assessment of the site, and reported that there was approximately 40,000 cubic yards of waste at the site, consisting of foundry sand, chemical products, construction debris and other industrial wastes from heavy manufacturing operations.

### **Initial Response**

Special Notice letters for the Remedial Investigation/Feasibility Study (RI/FS) were sent to approximately 12 Potentially Responsible Parties (PRPs) in August, 1987. The PRPs did not submit a "good faith" proposal to EPA to conduct the RI/FS. Negotiations were formally concluded in October, 1987, and the RI/FS was conducted by EPA.

The RI/FS for the Folkertsma Refuse site was initiated in 1989, and the final RI report was released in 1990. The major findings of the RI include:

- Landfilled materials contain volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and metals at concentrations above background levels.
- Some contaminants have migrated into a muck deposit beneath the landfill, or, in areas where there is little or no muck, to a limited extent into an underlying sand and gravel unit. Contaminants have also migrated into the sediments of the two on-site ditches and Indian Mill Creek. There is an estimated 12,300 cubic yards of contaminated black earth with decayed matter, muck, and 1,300 cubic yards of contaminated sediment at the site.
- Shallow groundwater beneath the landfill discharges to the two on-site drainage ditches

and Indian Mill Creek. Deeper groundwater beneath the landfill flows beneath Indian Mill creek and continues toward the Grand River.

- Arsenic and polynuclear aromatic hydrocarbons (PAHs) were detected above maximum contaminant levels (MCLs) in shallow unfiltered groundwater samples collected from beneath the landfill. Comparison of filtered and unfiltered groundwater data, however, indicates that these contaminants are not dissolved in the groundwater, but rather attach onto particulate matter.
- Beryllium and cadmium were detected above water quality criteria for freshwater in unfiltered surface water samples collected from one of the drainage ditches. Beryllium was detected above the chronic standard at one location, while cadmium was detected above both the chronic and acute standards at two locations. Comparison of filtered and unfiltered drainage water samples, however, indicates that these chemicals are suspended in the drainage water rather than dissolved.
- The landfilled materials pose an unacceptable carcinogenic risk to human health under worst case conditions for ingestion ( $10^{-4}$ ), direct contact ( $10^{-3}$ ), and inhalation ( $10^{-4}$ ). The main contaminants posing the risks are PAHs (ingestion and direct contact) and chromium (inhalation). No unacceptable human health risks were identified for exposure to the landfilled materials under probable case conditions.
- The ingestion of shallow groundwater beneath the landfill poses unacceptable potential future carcinogenic risks to human health of  $10^{-3}$  and  $10^{-2}$  under probable and worst case conditions respectively. The Hazard Indices calculated for future ingestion of shallow groundwater for probable and worst case conditions are 1.62 and 29.7 respectively. The risks posed by ingestion of shallow groundwater are based on the PAHs and high levels of arsenic detected in unfiltered groundwater samples collected from beneath the landfill. PAHs and arsenic, however, have a limited potential to migrate and were not detected in downgradient groundwater samples.
- Potential future carcinogenic and noncarcinogenic human health risks calculated for the ingestion of deep groundwater under worst case conditions are  $10^{-4}$  and 2.54 respectively. These potential future worst case risks are also based on unfiltered groundwater samples collected from directly beneath the landfill. In addition, the chemical concentrations driving the risk are below MCLs.
- The landfilled materials and the contaminated sediments of the two on-site ditches and Indian Mill Creek pose an unacceptable risk to the environment through ingestion and direct contact. These risks are posed to the animal populations living at or near the site who may wade or swim in the streams, or walk, lay, or burrow in the landfilled materials. These risks will not be significant if exposure is infrequent. Frequent exposure, however, may result in the bioaccumulation of trichloroethene, PCBs, and metals including arsenic,

cadmium, chromium, lead, mercury, manganese, and nickel.

### **Basis for Taking Action**

#### **Contaminants**

Hazardous substances that have been released at the Site in each media included:

#### **Landfilled Materials**

Methylene Chloride	Indeno (1,2,3-cd) pyrene
Acetone	Dibenz (a,h) anthracene
Carbon disulfide	Benzo (g,h,i) perylene
2-Butanone	gamma-BHC
Trichloroethene	gamma-Chlordane
Benzene	Aroclor-1254
Tetrachloroethene	Antimony
Toluene	Calcium
Ethylbenzene	Chromium
Xylenes	Cobalt
Phenol	Copper
Benzoic acid	Iron
Naphthalene	Lead
Methylnaphthalene	Magnesium
Acenaphthylene	Nickel
Acenaphthene	Selenium
Dibenzofuran	Silver
Fluorene	Sodium
phenanthrene	
Anthracene	
Di-n-butylphthalate	
Fluoranthene	
Pyrene	
Butylbenzylphthalate	
Benzo (a) anthracene	
Chrysene	
bis (2-Ethylhexyl) phthalate	
Benzo (b) fluoranthene	
Benzo (k) fluoranthene	

#### **Sediments**

Methylene Chloride

Acetone  
2-Butanone  
Toluene  
Naphthalene  
2-Methylnaphthalene  
Acenaphthylene  
Acenaphthene  
Fluorene  
Pentachlorophenol  
Phenanthrene  
Anthracene  
Di-n-butylphthalate  
Fluoranthene  
Pyrene  
Benzo(a) anthracene  
Chrysene  
bis (2-Ethylhexyl) phthalate  
Benzo (b) fluoranthene  
Benzo (k) fluoranthene  
Benzo (a) pyrene  
Indeno (1,2,3-cd) pyrene  
Dibenzo (a,h) anthracene  
Benzo (g,h,i) perylene  
gamma-BHC(Lindane)  
4,4"-DDE  
Endosulfan II  
gamma-Chlordane  
Aroclor-1254  
Arsenic  
Barium  
Calcium  
Copper  
Iron  
Lead  
Magnesium  
Nickel  
Zinc

#### **Shallow Groundwater**

Toluene



Naphthalene  
Acenaphthen  
Dibenzofuran  
Fluorene  
Phenanthrene  
Anthracene  
Fluoranthene  
Benzo (a) anthracene  
Chrysene  
Benzo (b) fluoranthene  
Benzo (k) fluoranthene  
Benzo (a) pyrene  
Arsenic  
Manganese  
Mercury  
Silver

#### **Deep Groundwater**

Beta-BHC  
Aluminum  
Barium  
Cadmium  
Copper  
Iron  
Lead  
Manganese  
Potassium  
Arsenic  
Mercury

#### **Surface Water**

Beryllium  
Cadmium  
Chromium  
Iron  
Lead  
Magnesium  
Manganese

Mercury  
Silver  
Zinc  
Trichloroethene

#### **IV. Remedial Actions**

##### **Remedy Selection**

A ROD for the Site was signed by EPA on June 6, 1991 that included the following components.

The major components of the selected remedy for the Folkertsma Refuse site include:

- Excavation of contaminated sediments from the two on-site ditches and Indian Mill Creek for consolidation with the landfilled materials;
- Conversion of the two on-site ditches into permeable underground drains to provide for continued site drainage;
- Construction of a cap over contaminated sediments and landfilled materials in accordance with the requirements of the Resource Conservation and Recovery Act Subtitle D and Michigan Solid Waste Management Act 641;
- Installation of passive gas vents to prevent the buildup of volatile organic compounds and methane, if necessary;
- Placement of a layer of topsoil and a vegetative covering over the clay cap and landfilled materials;
- Site fencing and institutional controls such as deed restrictions to prevent the installation of drinking water wells within the landfilled portion of the site and future disturbance of the cap and landfilled materials;
- Implementation of long-term groundwater and drainage water monitoring programs to ensure the effectiveness of the remedial action.

The remedy selected for the Folkertsma Refuse site eliminates or reduces the risks posed by the site through the use of engineering and institutional controls. The selected remedy provides for the containment of the large volume of low level organic and inorganic waste material present in the landfill, the black earth with decaying matter, muck, deposit beneath the landfill, and the contaminated sediments of the two on-site ditches and Indian Mill Creek; reduces the potential for contaminant migration into the groundwater; and reduces the potential for contaminated groundwater to move out from beneath the landfill.

U.S. EPA entered into negotiations with the potentially responsible parties (PRPs) for the Folkertsma Refuse site in July, 1991 for the performance of the Remedial Design and Remedial Action (RD/RA). Negotiations concluded in March, 1992, and the PRPs entered into a Consent Decree with U.S. EPA for past response costs and performance of the RD/RA. The Consent

Decree was lodged in May, 1991, and entered in August, 1991. The RD was initiated in May, 1992, and was complete in September, 1993.

### **Remedy Implementation**

Remedial Action construction activities began in March, 1994. Construction activities included: site clearing and regrading, relocation of on-site pallet company operations; sediment excavation, solidification and consolidation with the landfilled materials; conversion of two on-site ditches into permeable underground drains and replacing the Indian Mill Creek drain pipe with an open channel; monitoring well abandonment, replacement and construction; installation of probes for landfill gas monitoring; and construction of a cap consisting of 2 feet of clay followed by a 6 inch sand drainage layer, 1 foot rooting zone layer and 6 inch topsoil layer.

A pre-final inspection of the construction activities was conducted by the U.S. EPA remedial project manager and the U.S. EPA ARCS oversight contractor on August 25, 1994. The MDEQ was unable to participate in the pre-final inspection; however, MDEQ staff had participated in various oversight activities and periodic site visits during the construction. During the pre-final inspection, it was determined that the landfill cap and underground drainage systems were constructed as designed and that they were operational. A punch list of minor tasks (e.g., removal of construction debris, seeding, fencing) to be completed was developed by the PRP's construction quality assurance engineer and given to the PRP's contractor with a schedule for completion of those items.

The U.S. EPA held a final inspection at the site on October 27, 1994, at which time the completed punch list items were verified. Also, site fencing and institutional controls such as deed restrictions prohibiting installation of drinking water wells on the site and future disturbance of the cap and landfilled materials were in place.

The construction completion report dated February, 1995 certifies completion of all remedial action and documents that the objectives of the remedial action have been met. This report certifies that all major components of the remedy are complete with the exception of environmental monitoring which is a long-term ongoing part of the remedy. The equipment to conduct the long-term monitoring was installed as part of this project.

### **System Operation/Operation and Maintenance**

A monitoring program for the site was approved, by US EPA and MDEQ. The program was to monitor groundwater and drainage water to establish the O&M phase of the cleanup to ensure that contaminants detected in the landfill were not migrating out from beneath the landfill. In addition, landfill gas was also monitored during O&M to determine the need for the installation of a passive gas collection system. Long term operation, maintenance and monitoring at the Folkertsma Refuse site has been conducted by the PRPs under oversight of U.S. EPA, in consultation with the MDEQ.

As part of the groundwater and drainage water monitoring programs for the Folkertsma Refuse site, groundwater and drainage water were to be monitored on a quarterly and semi-annual basis until a minimum of ten years of monitoring data have been collected. At the end of ten years, the results of the groundwater and drainage water monitoring would be reviewed to determine whether chemical concentrations in the groundwater and drainage water exceed background concentrations, and whether either of the monitoring programs, or specific analytical parameters of either program, may be discontinued. Discontinuance of the monitoring programs and specific analytical parameters is subject to the approval of U.S. EPA, in consultation with the MDEQ.

Gas monitoring, however, will be conducted on a monthly basis for six months, then reduced to a quarterly basis for the next year and a half (minimum). Discontinuance of the landfill gas monitoring program is also subject to U.S. EPA approval, in consultation with the MDEQ. Details of the groundwater, drainage water and gas monitoring programs are provided in the approved O&M plan and the QAPP for Environmental Monitoring.

Long-term operation and maintenance of the landfill cover are being conducted by the Potentially Responsible Parties (PRPs) and the U.S. Environmental Protection Agency (U.S. EPA). Consistent with the Resource Conservation and Recovery Act of 1976, as amended, 40 CFR part 264.111, the cleanup of the site is in compliance with "clean closure" requirements. The regular maintenance for the site that is included in the construction completion report are listed below:

- Quarterly site inspections and identification of maintenance actions.
- Restoration of damaged landfill cover areas.
- Vegetation establishment and cultivation.
- Annual mowing of the landfill vegetation.
- Sediment removal in the drainage swales.
- Restoration of damaged sections of drainage ditches.
- Restoration/replacement of damaged fencing, monitoring wells, and gas probes.

In 2001, the U.S. EPA, in consultation with the MDEQ approved a change in the monitoring frequency for the landfill gas monitoring, the groundwater, surface water and site inspections be conducted in March and September. Also, if a change occurs in the amount of landfill gas generated, U. S. EPA and MDEQ reserve the right to increase the monitoring frequency.

**Table 2 - Annual System Operations/O&M Costs**

<b>Dates</b>		<b>Total Cost</b>
<b>From</b>	<b>To</b>	
1/1999	12/1999	\$67,071
1/2000	12/2000	\$41,163
1/2001	12/2001	\$78,000
1/2002	12/2002	\$44,500
1/2003	12/2003	\$36,300

**V. Progress Since the Last Five-Year Review**

The PRP requested changes in the original O & M plan was approved by EPA, in consultation with the MDEQ, in March 2003 which contained the following:

**For Ground Water:**

Eliminate arsenic, cadmium, cobalt, mercury, nickel, and selenium from all future monitoring events because these parameters were not detected at concentrations above the detection limit within the last three years

**For Surface Water:**

Reduce the monitoring frequency for copper, lead, manganese, silver, and zinc from semiannual to annual because these parameters were not detected at concentrations above their respective generic GSI criteria within the last three years.

**VI. Five-year Review Process**

**Administrative Components**

This Five-Year Review Report was written and completed by U. S. EPA, based on the technical review of the Site by members of both the MDEQ staff. This Five-Year Review Report was written by Gladys Beard of EPA.

From January 1, 2001 to December 31, 2003 the review team established the review schedule whose components included:

- Community Involvement;

- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

### **Community Involvement**

Notice will be made to the public announcing the Five-Year Review Report and providing a summary of Five-Year Review findings, protectiveness of the remedy, and advising the community where a copy of the review report can be found. This Five-Year Review Report can be found in the Site's Information Repository and at US EPA, 77 W. Jackson, Chicago, IL 60604.

### **Document Review**

This Five-Year Review consisted of a review of relevant documents including O & M records, monitoring data, the previous five year inspection reports and Five Year Review report.

### **Data Review**

#### **Groundwater Monitoring**

In 1999, groundwater samples were collected from each of the eight monitoring wells on site. Samples were collected at each well for the analysis of volatile organic compounds (VOCs), polynuclear aromatic hydrocabons (PNAs), and Target Analyte List(TAL) Metals following contract laboratory protocols (CLP). Analytical results are included in Appendix A.

The 2000 groundwater results were compared with the Michigan Part 201 generic GSI criteria. As shown in Table 1, none of the reported concentrations of inorganic constituents exceeded the generic GSI criteria. Additionally, no VOCs were detected in any wells (Table 2) in December 2000.

Groundwater results for 2001 are shown in Table 2, none of the reported concentrations of inorganic constituents exceeded the generic GSI criteria and no VOCs were detected in any wells in March 2001.

In 2002 groundwater samples were collected at each of the eight monitorings wells on April 29 and 30, 2002, and were analyzed for the field parameters listed in Table 1, and for the nine inorganic constituents listed in Table 2. The laboratory reports for the April sampling event are

included in Attachment A, and summarized in Tables 1 and 2.

For 2003 Groundwater samples were collected at each of the eight monitoring wells on April 30 and May 1, 2003. The laboratory results are summarized in Tables C-1 through C-4 of Appendix C.

### **Surface Water Monitoring**

In 1999, surface water samples were collected for analysis of VOCs, PNAs and Total Metal following CLP. Surface water samples were collected from three locations: downstream of the confluence of the unnamed creek and the excavated ditch; from a drainage ditch west of the site (background samples); and from the same drainage ditch as it enters the site. Analytical results are included in Appendix A.

In 2001 the surface water quality results were compared with the Michigan Rule 57 criteria (R323.1057 of the Michigan Administrative Code). This comparison for the inorganic constituents, as shown in table 2 for the March 2001 results, shows that there were no exceedances of the Rule 57.

Surface water samples were collected on December 2000 and on January 2001 and were analyzed for the same 20 inorganic constituents and VOCs as the groundwater samples. The surface water samples were collected from two locations, one downstream of the confluence of the unnamed creek and the excavated ditch and one upstream in the undamed creek. The laboratory reports are included as Appendix A, and are summarized in Tables 4 through 6.

In 2002, surface water samples were collected at two sampling locations and were analyzed for the same nine inorganic constituents as the groundwater samples. One surface water sample was collected from a location downstream of the confluence of the unnamed creek and the excavated ditch (SW-1), and the other was collected upstream in the unnamed creek (SWBG-1). The laboratory reports for the April sampling event are included in Attachment A, and are summarized in Tables 1 and 2.

In accordance with the April 2001 revision of the O & M Plan, the surface water quality results from the annual monitoring event were compared with the Michigan Rule 57 criteria (R323.1057 of the Michigan Administrative Code). For the constituents of interest at this site, the lowest of the relevant Rule 57 criteria are the same as the generic GSI Criteria. As shown in Table C-1 of Appendix C, this comparison for the inorganic constituents showed that two Rule 57 criteria were exceeded in 2003. The exceedences were detected in both of the samples collected at SW-1 and SWBG-1. These results are not attributed to the facility because one of the results occurs in SWBG-1, a background monitoring point, located upgradient and to the west of the facility.

### **Gas Monitoring**

U. S. EPA and MDEQ reduced the gas monitoring from quarterly to semiannually monitoring in July of 2001. Monitoring was changed to semiannually, because the data show that the methane has not been detected above 0.15 percent (3 percent of the Lower Explosive Limit) at GP1 over the period of record and not above 0.4 percent (8 percent of the LEL) at GP3 since April 1995. The Summary of the landfill gas measurements data sets over the past 6 years have proved the amount of gas generated has been reduced.

The gas probes were monitored on May 9 and October 10, 2003, the monitoring results are located in Appendix B.

### **Site Inspection**

A Site Inspection at the site was conducted on October 16, 2003 by U.S. EPA, MDEQ and PRPs representatives. The purpose of the inspection was to assess the protectiveness of the remedy, including the common maintenance activities: annual mowing of landfill cover, grass and brush trimming around wells, fence repair/maintenance, access road maintenance, snow plowing, and litter control. During the inspection, U.S. EPA and the MDEQ walked around the perimeter of the landfill and down the center drainage swale, and inspected the surface of the landfill, the vegetative covering, the fence, monitoring wells, gas probes, drainage ditches and Indian Mill Creek. No breaches in the cap or subsidence were observed.

### **Interviews**

In processing this report U. S. EPA interviewed the PRPs representatives and MDEQ to obtain information.

## **VII. Technical Assessment**

### **Question A: Is the remedy functioning as intended by the decision documents?**

Yes, the review of documents, ARARS, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. The conversion of the two on-site ditches into permeable underground drains to provide for continued site drainage and capping of the contaminated landfill have achieved the remedial objectives to minimize contaminants to groundwater and surface water and prevent direct contact with, or ingestion of, contaminants in soil and groundwater. The effective implementation of institutional controls has prevented exposure to, or ingestion of, contaminated groundwater.

Operation and maintenance (O & M) of the cap and groundwater have been effective. O & M annual costs are consistent with original estimates and there are no indications of any difficulties with the remedy.

No activities were observed that would have violated the institutional controls. The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed. The fence



around the Site is intact and in good repair.

**Question B: Are the exposure assumptions, toxicity data cleanup levels and remedial action objectives (RADs) used at the time of the remedy selection still valid?**

**Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics**

Yes, the exposure assumptions used to develop the Human Health Risk Assessment included both current exposures (older child trespasser, adult trespasser) and potential future exposures (young and older future child resident, future adult resident and future adult worker). There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment. These assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based cleanup levels. No change to these assumptions, or the cleanup levels developed from them is warranted. There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. The remedy is progressing as expected and it is expected that all groundwater cleanup levels will be met within approximately the time frame stated in the ROD.

**Question C: Has any other information come to light that could call into question the protectiveness of the remedy?**

No, ecological targets were identified during the baseline risk assessment and none were identified during the five-year review, and therefore monitoring of ecological targets is not necessary. All groundwater and surface water samples analyzed found no contamination of wetlands or surface water. No weather-related events have affected the protectiveness of the remedies. There is no other information that calls into question the protectiveness of the remedies. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

**Technical Assessment Summary**

According to the data reviewed, the site inspection, and the interviews, the remedies are functioning as intended by the ROD. There are no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Groundwater and surface water concentrations have been reducing and are expected to achieve cleanup levels as stated in the ROD. There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedies. There is no other information that calls into question the protectiveness of the remedies.

## VIII. Issues

**Table 3: Issues**

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Continue groundwater sampling	N	Y
Continue surface water sampling	N	Y

## IX. Recommendations and Follow-up Actions

**Table 4: Recommendations and Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Continue to remove contaminant through the gas sytem	The gas system will continue	PRPs	PRPs	Continuous	N	Y

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Continue with routine site maintenance. Site should be inspected 1-2 years to ensure conditions	Ground water and methane monitoring, inspections, erosion repair and mowing will be continue	PRPs	PRPs	Continue	N	Y
Put Site in reuse	Do weight test to see if the clay cover will not be affect	PRPs	PRPs	2004	N	Y

## **X. Protectiveness Statement(s)**

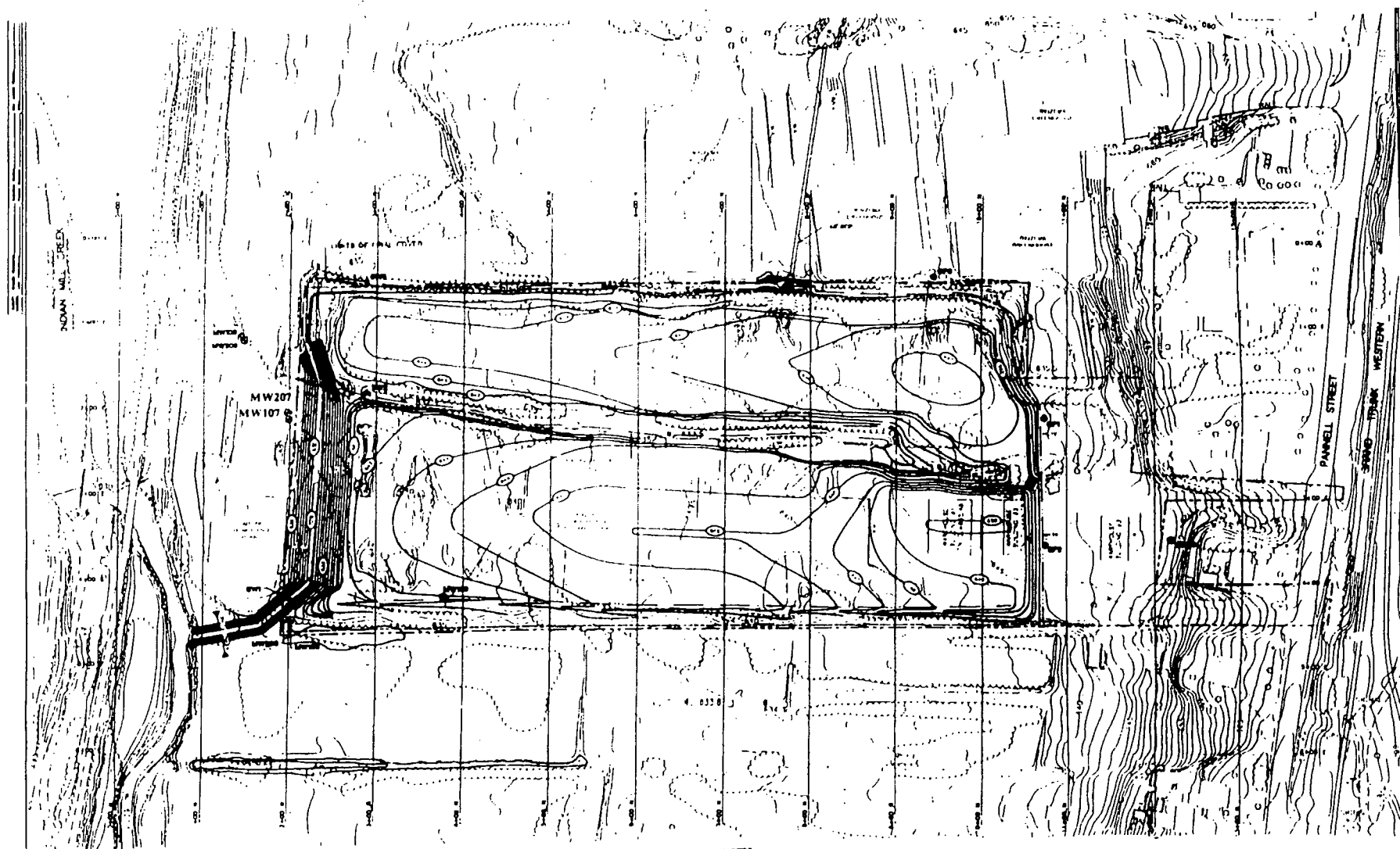
The remedy is protective in the short-term of human health and the environment. All immediate threats at the site have been addressed. All threats at the Site have been addressed with a layer of topsoil and a vegetative cap, to contain contaminated groundwater discharges from the landfill through conversion of the two on-site ditches into permeable underground drains to provide for continued site drainage.

Long-term protectiveness of human health and environment will be achieved upon attainment of groundwater cleanup goals, through implementation of long-term groundwater and drainage water monitoring programs to ensure the effectiveness of the remedial action.

Long-term protectiveness of the remedial action will be verified by conducting monitoring and site inspections to assure the effectiveness of the remedy.

## **XI.      Next Review**

The next five-year review for the Site will be completed five years from this report in February 2009.



# LEGEND

--- APPROPRIATE PROPERTY LINE  
 --- TRAIL LINE  
 --- WATER LINE  
 --- DRAINAGE ROAD  
 --- LIMITS OF FINAL COVER  
 --- DRAINAGE STAKE

MW207 MONITORING WELL LOCATION AND NUMBER  
 MW107 MONITORING WELL LOCATION AND NUMBER  
 GWP PROPOSED GAS PNEUM LOCATION AND NUMBER  
 WWP PROPOSED SURFACE WATER MONITORING LOCATION AND NUMBER

## NOTES

1. SHAL MAP DEVELOPED FROM AERIAL SURVEY PERFORMED BY ARPAH'S AERIAL SURVEY CORPORATION, DRAWING NO. 1047-11-1885 DATED 07-70-92 AND SUPPLEMENTED BY DATA COLLECTED BY PRIN AND RETICED, DATED 9-1-93.
2. TOPOGRAPHIC CONTOUR INTERVAL IS 1 FOOT.
3. GWP SYSTEM BASED ON LINE BETWEEN THE SW CORNER OF THE BUILDING PLANT BUILDING AND THE SW CORNER OF WAREHOUSE BUILDING #1. THE PROPOSED GWP SYSTEM IS PARALLEL AND PERPENDICULAR TO THIS LINE SETTING THE SW CORNER OF THE BUILDING PLANT AT 1:00 PM, 2:00 PM.

This drawing has been reduced to one half the original size.



FIGURE 1

ENVIRONMENTAL MONITORING PLAN

LOCAL 15304  
 1000 W. MAIN ST.  
 SOUTHWEST CORNER  
 OF 1000 W. MAIN ST.  
 WEST COUNTY, MICHIGAN

17 of 111

2500078

010



**A**

**VALIDATED DATA SUMMARY**

**Folkertsma Groundwater and Surface Water  
Summary of Validated Data**

LABNO		214055	214057	214052	214051	214050	214056	214058	214053
Analyte	Units	FR-MW106-16 9/23/98	FR-MW107R-16 9/23/98	FR-MW108-16 9/23/98	FR-MW192-16 9/23/98	FR-MW201-BG-16 9/23/98	FR-MW206-16 9/23/98	FR-MW207R-16 9/23/98	FR-MW208-16 9/23/98
Volatiles									
Chloromethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl chloride	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Acetone	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethene (trans)	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon tetrachloride	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylenes (total)	ug/L	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
2-Chloroethyl vinyl ether	ug/L	1 U/U	1 U/U	1 U/U	1 U/U	1 U/U	1 U/U	1 U/U	1 U/U
Trichlorofluoromethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-dichlorobenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-dichlorobenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-dichlorobenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

**Folkertsma Groundwater and Surface Water  
Summary of Validated Data**

LABNO		214061	214054	214062	214049	214059	214060
Analyte	Units	FR-MW208-DUP-16 9/23/98	FR-SWCOMB-16 9/23/98	FR-SWCOMB-DUP-16 9/23/98	EQUIPMENT BLANK1-16 9/23/98	EQUIPMENT BLANK2-16 9/23/98	TRIP BLANK-16 9/23/98
Volatiles							
Chloromethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Bromomethane	ug/l.	1 U/U/	1 U/	1 U/U/	1 U/	1 U/U/	1 U/U/
Vinyl chloride	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Chloroethane	ug/l.	1 U/U/	1 U/	1 U/U/	1 U/	1 U/U/	1 U/U/
Methylene chloride	ug/l.	1 U/U/	1 U/	1 U/U/	1 U/	1 U/U/	1 U/U/
Acetone	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,1-Dichloroethene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,1-Dichloroethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,2-Dichloroethene (trans)	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Chloroform	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,2-Dichloroethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,1,1-Trichloroethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Carbon tetrachloride	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Bromodichloromethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,2-Dichloropropane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
cis-1,3-Dichloropropene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Trichloroethene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Dibromochloromethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,1,2-Trichloroethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Benzene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
trans-1,3-Dichloropropene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Bromoform	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Tetrachloroethene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,1,2,2-Tetrachloroethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Toluene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Chlorobenzene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Ethylbenzene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
Xylenes (total)	ug/l.	3 U/	3 U/	3 U/	3 U/	3 U/	3 U/
2-Chloroethyl vinyl ether	ug/l.	1 U/U/	1 U/U/	1 U/U/	1 U/U/	1 U/U/	1 U/U/
Trichlorofluoromethane	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,2-dichlorobenzene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,3-dichlorobenzene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/
1,4-dichlorobenzene	ug/l.	1 U/	1 U/	1 U/	1 U/	1 U/	1 U/



**Folkertsma Groundwater and Surface Water  
Summary of Validated Data**

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		FR-MW106-16	FR-MW107R-16	FR-MW108-16	FR-MW109-16	FR-MW201-BG-16	FR-MW206-16	FR-MW207R-16	FR-MW208-16
<b>PNAs</b>									
Naphthalene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Acenaphthylene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Acenaphthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Fluorene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Phenanthrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Anthracene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Fluoranthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Pyrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Benzo(a)anthracene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Chrysene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Benzo(b)fluoranthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Benzo(k)fluoranthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Benzo(a)pyrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Indeno(1,2,3-cd)pyrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Dibenz(a,h)anthracene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Benzo(g,h,i)perylene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
<b>Dissolved Metals - Filtered</b>									
Aluminum	ug/l.	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/
Arsenic	ug/l.	2 S/	1 U/S/	3 S/	1 U/S/	1 U/S/	1 U/S/	1 U/S/	4 S/
Barium	ug/l.	68 /	140 /	47 /	110 /	120 /	63 /	240 /	120 /
Beryllium	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Cadmium	ug/l.	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/
Chromium	ug/l.	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/
Cobalt	ug/l.	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/
Copper	ug/l.	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/
Iron	ug/l.	1500 /	680 /	680 /	20 U/	20 U/	660 /	330 /	570 /
Lead	ug/l.	3 U/	3 U/	3 U/	3 U/	3 U/	3 U/	3 U/	3 U/
Magnesium	ug/l.	29000 /	32000 /	30000 /	32000 /	31000 /	32000 /	33000 /	35000 /
Manganese	ug/l.	63 /	23 /	15 /	27 /	16 /	17 /	110 /	130 /
Mercury	ug/l.	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/
Nickel	ug/l.	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/
Potassium	ug/l.	2800 /	1300 /	1200 /	1700 /	1200 /	1000 /	1400 /	3900 /
Selenium	ug/l.	2 U/S/	2 U/S/	2 U/S/	2 U/S/	2 U/S/	2 U/S/	2 U/S/	2 U/S/
Silver	ug/l.	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/
Sodium	ug/l.	20000 /	9100 /	16000 /	14000 /	24000 /	6800 /	13000 /	21000 /
Thallium	ug/l.	2 U/	2 U/	2 U/	2 U/	2 U/	2 U/	2 U/	2 U/
Zinc	ug/l.	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/

**Folkertsma Groundwater and Surface Water  
Summary of Validated Data**

LABNO		214061	214054	214062	214049	214059	214060
		FR-MW208-DUP-16	FR-SWCOMB-16	FR-SWCOMB-DUP-16	EQUIPMENT BLANK1-16	EQUIPMENT BLANK2-16	TRIP BLANK-16
PNAs							
Naphthalene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Acenaphthylene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Acenaphthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Fluorene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Phenanthrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Anthracene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Fluoranthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Pyrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Benzo(a)anthracene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Chrysene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Benzo(b)fluoranthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Benzo(k)fluoranthene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Benzo(a)pyrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Indeno(1,2,3-cd)pyrene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Dibenz(a,h)anthracene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Benzo(g,h,i)perylene	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Dissolved Metals - Filtered							
Aluminum	ug/l.	50 U/	50 U/	50 U/	50 U/	50 U/	NA
Arsenic	ug/l.	4 S/	2 S/	2 S/	1 U/S/	1 U/S/	NA
Barium	ug/l.	110 /	84 /	84 /	10 U/	10 U/	NA
Beryllium	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Cadmium	ug/l.	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	NA
Chromium	ug/l.	10 U/	10 U/	10 U/	10 U/	10 U/	NA
Cobalt	ug/l.	50 U/	50 U/	50 U/	50 U/	50 U/	NA
Copper	ug/l.	20 U/	20 U/	20 U/	20 U/	20 U/	NA
Iron	ug/l.	560 /	20 U/	20 U/	20 U/	20 U/	NA
Lead	ug/l.	3 U/	3 U/	3 U/	3 U/	3 U/	NA
Magnesium	ug/l.	34000 U/	31000 /	30000 /	1000 U/	1000 U/	NA
Manganese	ug/l.	130 U/	16 /	12 /	10 U/	10 U/	NA
Mercury	ug/l.	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	NA
Nickel	ug/l.	20 U/	20 U/	20 U/	20 U/	20 U/	NA
Potassium	ug/l.	4000 /	3000 /	2900 /	100 U/	100 U/	NA
Selenium	ug/l.	2 U/S/	2 U/S/	2 U/S/	2 U/S/	2 U/S/	NA
Silver	ug/l.	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	NA
Sodium	ug/l.	20000 /	39000 /	38000 /	2000 U/	2000 U/	NA
Thallium	ug/l.	2 U/	2 U/	2 U/	2 U/	2 U/	NA
Zinc	ug/l.	10 U/	2 U/	10 U/	10 U/	10 U/	NA

**Folkertsma Groundwater and Surface Water  
Summary of Validated Data**

LABNO	214055	214057	214052	214051	214050	214056	214058	214053
	FR-MW106-16	FR-MW107R-16	FR-MW108-16	FR-MW109-16	FR-MW201-BG-16	FR-MW206-16	FR-MW207R-16	FR-MW208-16
Total Metals - Unfiltered								
Aluminum	ug/l. 71 /	50 U/	50 U/	140 /	50 U/	83	160	110
Arsenic	ug/l. 4 S/U	4 S/U	2 S/U	1 U/S/	6 S/	2 S/U	1 U/S/	4 S/U
Barium	ug/l. 72 /	140 /	48 /	120 /	120 /	64 /	260 /	120 /
Beryllium	ug/l. 5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/	5 U/
Cadmium	ug/l. 0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/
Chromium	ug/l. 10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/
Cobalt	ug/l. 50 U/	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/	50 U/
Copper	ug/l. 20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/
Iron	ug/l. 2500 /	710 /	700 /	110 /	20 U/	670 /	850 /	960 /
Lead	ug/l. 3 U/	3 U/	3 U/	3 U/	3 U/	3 U/	3 U/	3 U/
Magnesium	ug/l. 29000 /	33000 /	30000 /	32000 /	32000 /	32000 /	34000 /	35000 /
Manganese	ug/l. 64 /	24 /	15 /	28 /	16 /	17 /	120 /	130 /
Mercury	ug/l. 0.2 /U	0.3 /U	0.2 /U	0.2 U/	0.2 /U	0.3 /U	0.3 /U	0.2 /U
Nickel	ug/l. 20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/	20 U/
Potassium	ug/l. 2600 /	1100 /	1200 /	1600 /	1200 /	1000 /	1300	3800 /
Selenium	ug/l. 2 S/	2 S/U	2 S/U	2 U/S/	2 U/S/	2 U/S/	2 U/S/	2 U/S/
Silver	ug/l. 0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/
Sodium	ug/l. 20000 /	9400 /	16000 /	14000 /	25000 /	6900 /	13000 /	21000 /
Thallium	ug/l. 2 U/	2 U/	2 U/	2 U/	2 U/	2 U/	2 U/	2 U/
Zinc	ug/l. 10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/	10 U/

**Folkertsma Groundwater and Surface Water  
Summary of Validated Data**

LABNO		214061	214054	214062	214049	214050	214060
		FR-MW208-DUP-16	FR-SWC0MB-16	FR-SWC0MB-DUP-16	EQUIPMENT BLANK1-16	EQUIPMENT BLANK2-16	TRIP BLANK-16
<i>Total Metals - Unfiltered</i>							
Aluminum	ug/l.	99 /	53 /J	85 /J	50 U/	50 U/	NA
Arsenic	ug/l.	3 S/U <sup>1</sup>	1 S/U <sup>1</sup>	1 U/S/	1 S/	1 S/	NA
Barium	ug/l.	120 /	85 /	86 /	10 U/	10 U/	NA
Beryllium	ug/l.	5 U/	5 U/	5 U/	5 U/	5 U/	NA
Cadmium	ug/l.	0.2 U/	0.2 U/	0.2 U/	0.2 U/	0.2 U/	NA
Chromium	ug/l.	10 U/	10 U/	10 U/	10 U/	10 U/	NA
Cobalt	ug/l.	50 U/	50 U/	50 U/	50 U/	50 U/	NA
Copper	ug/l.	20 U/	20 U/	20 U/	20 U/	20 U/	NA
Iron	ug/l.	1000 /J	20 U/	20 U/	20 U/	20 U/	NA
Lead	ug/l.	3 U/	3 U/	3 U/	3 U/	3 U/	NA
Magnesium	ug/l.	34000 /	30000 /	31000 /	1000 U/	1000 U/	NA
Manganese	ug/l.	130 /	21 /	12 /	10 U/	10 U/	NA
Mercury	ug/l.	0.2 /U <sup>1</sup>	0.3 /U <sup>1</sup>	0.4 /U <sup>1</sup>	0.2 U/	0.4 /	NA
Nickel	ug/l.	20 U/	20 U/	20 U/	20 U/	20 U/	NA
Potassium	ug/l.	3800 /	2900 /	2900 /	100 U/	100 U/	NA
Selenium	ug/l.	2 U/S/	2 U/S/	2 U/S/	2 U/S/	2 U/S/	NA
Silver	ug/l.	0.5 U/	0.5 U/	0.5 U/	0.5 U/	0.5 U/	NA
Sodium	ug/l.	20000 /	38000 /	39000 /	2000 U/	2000 U/	NA
Thallium	ug/l.	2 U/	2 U/	2 U/	2 U/	2 U/	NA
Zinc	ug/l.	10 U/	10 U/	10 U/	10 U/	10 U/	NA

**Qualifier Definitions:**

U/ - Not detected  
 J/ - Estimated value  
 /U/ - Not detected, estimated detection limit, data qualifier added  
 /J - Estimated value, data qualifier added  
 /U<sup>1</sup> - Not detected, data qualifier added  
 /R - Unusable, data qualifier added

S - Analysis performed using MSA  
 \* - Duplicate outside control limits  
 K - Detected, but below CRDL  
 B - Also detected in method blank  
 N - Matrix spike outside control limits

**Table 1**  
**Folkertsma Refuse Site**  
**Groundwater Sample Results**  
**Field Parameters**  
**December 2000**

PARAMETER	UNITS	BG MW-201	MW-106	MW-107R	MW-108	MW-109	MW-206	MW-207R	MW-208
COLOR, FIELD		CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR
CONDUCTANCE, SPECIFIC	UMHOS/CM	230	736	126	766	238	636	668	751
DEPTH TO WATER	FEET	9.64	5.66	7.52	5.52	12.94	6.26	7.58	5.67
ODOR, FIELD		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
PH, FIELD	SU	7.13	7.78	7.63	7.58	7.88	7.3	7.53	7.33
TEMPERATURE	DEG C	10.6	8.8	10.1	9.3	9.9	10.1	8.7	8.4
TURBIDITY, FIELD	NTU	1	2	7	6	2	1	7	4
WATER ELEVATION	FEET	641.42	631.58	631	630.35	631.96	631.57	630.94	630.2

**Table 2**  
**Folkertsma Refuse Site**  
**Groundwater Sample Results**  
**Inorganic Parameters**  
**December 2000**

PARAMETER	UNITS	GENERIC GSI CRITERIA <sup>(1)</sup>	MW-201 (background) (2)	MW-106 (2)	MW-207 DUP (2)	MW-107R (2)	MW-108 (2)	MW-109 (2)	MW-206 (2)	MW-207R (2)	MW-208 (2)
ALUMINUM, TOTAL	UG/L	NA	< 50	< 50	< 50	110	77	< 50	< 50	< 50	< 50
ARSENIC, TOTAL	UG/L	150	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
BARIUM, TOTAL	UG/L	1037	120	< 100	210	120	< 100	110	< 100	210	120
BERYLLIUM, TOTAL	UG/L	19	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
CADMIUM, TOTAL	UG/L	9	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
CHROMIUM, TOTAL	UG/L	216 <sup>(3)</sup>	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
COBALT, TOTAL	UG/L	100	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
COPPER, TOTAL	UG/L	27	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
IRON, TOTAL	UG/L	NA	< 100	1100	800	950	1400	110	990	850	870
LEAD, TOTAL	UG/L	107	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MAGNESIUM, TOTAL	UG/L	NA	32000	36000	31000	32000	28000	32000	37000	32000	35000
MANGANESE, TOTAL	UG/L	1079	22	70	140	27	< 20	< 20	22	130	170
MERCURY, TOTAL	UG/L	0.2 <sup>(4)</sup>	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
NICKEL, TOTAL	UG/L	239	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
POTASSIUM, TOTAL	UG/L	NA	1500	3200	1200	1300	1300	1500	1400	1200	3100
SELENIUM, TOTAL	UG/L	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
SILVER, TOTAL	UG/L	0.2	< 0.2 <sup>(4)</sup>	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20
SODIUM, TOTAL	UG/L	NA	25000	34000	10000	8400	15000	12000	16000	10000	15000
THALLIUM, TOTAL	UG/L	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
ZINC, TOTAL	UG/L	493	< 20	< 20	< 20	< 20	< 20	< 20	24	< 20	< 20

Note:

<sup>(1)</sup> Reference date for generic GSI criteria is June 7, 2000. For hardness-dependent GSI criteria, a hardness of 225 mg/L CaCO<sub>3</sub> for Indian Mill Creek in Kent County was used, as directed by Jack Wuycheck, MDEQ.

<sup>(2)</sup> Except as noted, the detection limits are the Contract Required Detection Limits from the USEPA-approved 1993 QAPP.

<sup>(3)</sup> Value is for chromium III.

<sup>(4)</sup> Generic GSI criterion is less than the Contract Required Detection Limit of 0.2 µg/L.

**Table 3**  
**Folkertsma Refuse Site**  
**Groundwater Sample Results**  
**Volatile Organic Compounds**  
**December 2000**

PARAMETER	UNITS	GSI <sup>(1)</sup> CRITERIA	MW-201 (background)	MW-106	MW-207 DUP	MW-107R	MW-108	MW-109	MW-206	MW-207R	MW-208
1,1,1-TRICHLOROETHANE	UG/L	200	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2,2-TETRACHLOROETHANE	UG/L	78	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2-TRICHLOROETHANE	UG/L	330	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-DICHLOROETHANE	UG/L	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-DICHLOROETHENE	UG/L	65	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-DICHLOROETHANE	UG/L	360	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-DICHLOROETHENE, TOTAL	UG/L	360	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
1,2-DICHLOROPROPANE	UG/L	290	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2-BUTANONE	UG/L	2200	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
2-HEXANONE	UG/L	NA	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
4-METHYL-2-PENTANONE	UG/L	NA	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
ACETONE	UG/L	1700	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
BENZENE	UG/L	200	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
BROMODICHLOROMETHANE	UG/L	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
BROMOFORM	UG/L	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
BROMOMETHANE	UG/L	35	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
CARBON DISULFIDE	UG/L	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
CARBON TETRACHLORIDE	UG/L	45	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
CHLOROBENZENE	UG/L	47	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
CHLORODIBROMOMETHANE	UG/L	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
CHLOROETHANE	UG/L	NA	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
CHLOROFORM	UG/L	170	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
CHLOROMETHANE	UG/L	NA	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
CIS-1,3-DICHLOROPROPENE	UG/L	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
ETHYLBENZENE	UG/L	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
METHYLENE CHLORIDE	UG/L	940	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
STYRENE	UG/L	80	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TETRACHLOROETHENE	UG/L	45	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TOLUENE	UG/L	140	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TRANS-1,3-DICHLOROPROPENE	UG/L	NA	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TRICHLOROETHENE	UG/L	200	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
VINYL CHLORIDE	UG/L	15	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
XYLENES, TOTAL	UG/L	35	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3

Note:

<sup>(1)</sup> Reference date for GSI criteria is June 7, 2000.

TABLE 1  
FOLKERTSMA REFUSE SITE  
GROUNDWATER AND SURFACE WATER FIELD PARAMETERS  
MARCH 2001

PARAMETER	UNITS	BG MW-201 <sup>(1)</sup> 3/12/2001 910688-007	MW-106 3/13/2001 910688-009	MW-107R 3/13/2001 910688-012	MW-108 3/12/2001 910688-003	MW-109 3/12/2001 910688-005	MW-206 3/13/2001 910688-011	MW-207R 3/13/2001 910688-013	MW-208 3/12/2001 910688-001	SW-1 3/12/2001 910688-004	SWBG 1-15 3/12/2001 910688-002
COLOR, FIELD		CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR
CONDUCTANCE, SPECIFIC	UMHOS/CM	693	929	639	761	651	972	672	706	835	924
DEPTH TO WATER	FEET	9.04	5.36	7.22	5.28	12.66	5.98	7.32	5.40		
ODOR, FIELD		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
OXIDATION/REDUCTION POTENTIAL	MV	56	-19	10	-10	26	-38	5	36	29	95
OXYGEN, DISSOLVED	MG/L	0.3	0.2	0.2	0.2	0.2	0.3	0.1	0.2	4	1.0
PH, FIELD	SU	7.23	7.03	7.23	7.17	7.14	7.24	7.24	7.07	6.30	5.94
TEMPERATURE	DEG C	10.4	7.0	9.0	9.0	9.9	9.5	7.3	7.2	9.2	10.1
TURBIDITY, FIELD	NTU	2	1	1	10	1	2	1	4	4	10
WATER ELEVATION	FEET	642.02	631.88	631.30	630.59	632.24	631.85	631.20	630.47		

**Notes:**

(<sup>1</sup>) MW-201 and SWBG-1 are background monitoring points



TABLE 2  
FOLKERTSMA REFUSE SITE  
GROUNDWATER AND SURFACE WATER INORGANIC PARAMETER RESULTS  
MARCH 2001

PARAMETER	UNITS	GENERIC GSI CRITERIA <sup>(1)</sup>	MW-208 3/12/2001 910688-001	MW-208 DUP 3/12/2001 910688-002	SW-1 3/12/2001 910688-004	SWBG-1 3/12/2001 910688-008
ALUMINUM, TOTAL <sup>(2)</sup>	µg/L	NA	< 50	< 50	< 50	210
ARSENIC, TOTAL <sup>(2)</sup>	µg/L	150	< 20	< 20	< 20	< 20
BARIUM, TOTAL <sup>(2)</sup>	µg/L	1037	< 100	100	< 100	< 100
BERYLLIUM, TOTAL <sup>(2)</sup>	µg/L	19	< 5.0	< 5.0	< 5.0	< 5.0
CADMIUM, TOTAL <sup>(2)</sup>	µg/L	9	< 0.50	< 0.50	< 0.50	< 0.50
CHROMIUM, TOTAL <sup>(2)</sup>	µg/L	216 <sup>(3)</sup>	< 5.0	< 5.0	< 5.0	< 5.0
COBALT, TOTAL <sup>(2)</sup>	µg/L	100	< 10	< 10	< 10	< 10
COPPER, TOTAL <sup>(2)</sup>	µg/L	27	5.9	5.4	11	12
IRON, TOTAL <sup>(2)</sup>	µg/L	NA	770	910	170	730
LEAD, TOTAL <sup>(2)</sup>	µg/L	107	< 3.0	< 3.0	< 3.0	< 3.0
MAGNESIUM, TOTAL <sup>(2)</sup>	µg/L	NA	31000	34000	32000	33000
MANGANESE, TOTAL <sup>(2)</sup>	µg/L	1079	140	170	22	59
MERCURY, TOTAL <sup>(2)</sup>	µg/L	0.2 <sup>(4)</sup>	< 0.20	< 0.20	< 0.20	< 0.20
NICKEL, TOTAL <sup>(2)</sup>	µg/L	239	< 25	< 25	< 25	< 25
POTASSIUM, TOTAL <sup>(2)</sup>	µg/L	NA	2900	2900	3100	3900
SELENIUM, TOTAL <sup>(2)</sup>	µg/L	5	< 5.0	< 5.0	< 5.0	< 5.0
SILVER, TOTAL <sup>(2)</sup>	µg/L	0.2 <sup>(4)</sup>	0.23 fu	< 0.20	< 0.20	< 0.20
SODIUM, TOTAL <sup>(2)</sup>	µg/L	NA	14000	16000	42000	48000
THALLIUM, TOTAL <sup>(2)</sup>	µg/L	3.7	< 2.0	< 2.0	< 2.0	< 2.0
ZINC, TOTAL <sup>(2)</sup>	µg/L	493	< 20	< 20	< 20	44

Notes:

<sup>(1)</sup> Reference date for generic GSI criteria is June 7, 2000. For hardness-dependent GSI criteria, a hardness of 225 mg/L CaCO<sub>3</sub> for Indian Mill Creek in Kent County was used, as directed by Jack Wuycheck, MDEQ. The Rule 57 Water Quality Values are the applicable criteria for surface water. For the constituents of interest at this site, the generic GSI criteria are the lowest of the relevant Rule 57 criteria (February 1, 2001).

<sup>(2)</sup> Except as noted, the detection limits are the Contract Required Detection Limits from the USEPA-approved 1993 QAPP.

<sup>(3)</sup> Value is for chromium III.

<sup>(4)</sup> Generic GSI criterion are less than the analytical Method Detection Limit (MDL) of 0.2 µg/L, and therefore defaults to the MDL. The target detection limit for mercury and silver is 0.2 µg/L, as stated in the April 2001 OM&M plan.

<sup>(5)</sup> Contract required detection limit (applicable to March 2001 sampling event) is 10 µg/L. Lower detection limit was reported by the laboratory.

f analyte present in field blank

u analyte considered non-detection on basis of blank detection

NA not available

TABLE 3  
FOLKERTSMA REFUSE SITE  
GROUNDWATER AND SURFACE WATER VOLATILES RESULTS  
MARCH 2001

PARAMETER	UNITS	GENERIC GSI CRITERIA <sup>(1)</sup>	BG MW-201 3/12/2001 910688-007	MW-106 3/13/2001 910688-009	MW-106 DUP 3/13/2001 910688-010	MW-107R 3/13/2001 910688-012
1,1,1-TRICHLOROETHANE	µg/L	200	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-TETRACHLOROETHANE	µg/L	78	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-TRICHLOROETHANE	µg/L	330	< 1.0	< 1.0	< 1.0	< 1.0
1,1-DICHLOROETHANE	µg/L	NA	< 1.0	< 1.0	< 1.0	< 1.0
1,1-DICHLOROETHENE	µg/L	65	< 1.0	< 1.0	< 1.0	< 1.0
1,2-DICHLOROETHANE	µg/L	360	< 1.0	< 1.0	< 1.0	< 1.0
1,2-DICHLOROETHENE, TOTAL	µg/L	360	< 2.0	< 2.0	< 2.0	< 2.0
1,2-DICHLOROPROPANE	µg/L	290	< 1.0	< 1.0	< 1.0	< 1.0
2-BUTANONE	µg/L	2200	< 5.0	< 5.0	< 5.0	< 5.0
2-HEXANONE	µg/L	NA	< 5.0	< 5.0	< 5.0	< 5.0
4-METHYL-2-PENTANONE	µg/L	NA	< 5.0	< 5.0	< 5.0	< 5.0
ACETONE	µg/L	1700	< 5.0	< 5.0	< 5.0	< 5.0
BENZENE	µg/L	200	< 1.0	< 1.0	< 1.0	< 1.0
BROMODICHLOROMETHANE	µg/L	NA	< 1.0	< 1.0	< 1.0	< 1.0
BROMOFORM	µg/L	NA	< 1.0	< 1.0	< 1.0	< 1.0
BROMOMETHANE	µg/L	35	< 2.0	< 2.0	< 2.0	< 2.0
CARBON DISULFIDE	µg/L	NA	< 1.0	< 1.0	< 1.0	< 1.0
CARBON TETRACHLORIDE	µg/L	45	< 1.0	< 1.0	< 1.0	< 1.0
CHLOROBENZENE	µg/L	47	< 1.0	< 1.0	< 1.0	< 1.0
CHLORODIBROMOMETHANE	µg/L	NA	< 1.0	< 1.0	< 1.0	< 1.0
CHLOROETHANE	µg/L	NA	< 2.0	< 2.0	< 2.0	< 2.0
CHLOROFORM	µg/L	170	< 1.0	< 1.0	< 1.0	< 1.0
CHLOROMETHANE	µg/L	NA	< 2.0	< 2.0	< 2.0	< 2.0
CIS-1,3-DICHLOROPROPENE	µg/L	NA	< 1.0	< 1.0	< 1.0	< 1.0
ETHYLBENZENE	µg/L	18	< 1.0	< 1.0	< 1.0	< 1.0
METHYLENE CHLORIDE	µg/L	940	< 1.0	< 1.0	< 1.0	< 1.0
STYRENE	µg/L	80	< 1.0	< 1.0	< 1.0	< 1.0
TETRACHLOROETHENE	µg/L	45	< 1.0	< 1.0	< 1.0	< 1.0
TOLUENE	µg/L	140	< 1.0	< 1.0	< 1.0	< 1.0
TRANS-1,3-DICHLOROPROPENE	µg/L	NA	< 1.0	< 1.0	< 1.0	< 1.0
TRICHLOROETHENE	µg/L	200	< 1.0	< 1.0	< 1.0	< 1.0
VINYL CHLORIDE	µg/L	15	< 2.0	< 2.0	< 2.0	< 2.0
XYLENE, TOTAL	µg/L	35	< 3.0	< 3.0	< 3.0	< 3.0

Notes

<sup>(1)</sup> Reference date for generic GSI criteria is June 7, 2000. For the constituents of interest at this site, the generic GSI criteria are the lowest of the relevant Rule 57 Water Quality Values (February 1, 2001).

The Rule 57 values are the applicable criteria for surface water.

NA = not available

FOLKERTSMA REFUSE SITE  
QC SAMPLE INORGANIC PARAMETER RESULTS  
MARCH 2001

PARAMETER	UNITS	FIELD BLANK 1	FIELD BLANK 2
		3/12/2001	3/13/2001
		9106888-006	9106888-014
ALUMINUM, TOTAL	µg/L	< 50	< 50
ARSENIC, TOTAL	µg/L	< 20	< 20
BARIUM, TOTAL	µg/L	< 100	< 100
BERYLLIUM, TOTAL	µg/L	< 5.0	< 5.0
CADMIUM, TOTAL	µg/L	< 0.50	< 0.50
CHROMIUM, TOTAL	µg/L	< 5.0	< 5.0
COBALT, TOTAL	µg/L	< 10	< 10
COPPER, TOTAL	µg/L	5.1	7.5
IRON, TOTAL	µg/L	< 100	< 100
LEAD, TOTAL	µg/L	< 3.0	< 3.0
MAGNESIUM, TOTAL	µg/L	< 100	< 100
MANGANESE, TOTAL	µg/L	< 20	< 20
MERCURY, TOTAL	µg/L	< 0.20	< 0.20
NICKEL, TOTAL	µg/L	< 25	< 25
POTASSIUM, TOTAL	µg/L	< 500	< 500
SELENIUM, TOTAL	µg/L	< 5.0	< 5.0
SILVER, TOTAL	µg/L	0.20	< 0.20
SODIUM, TOTAL	µg/L	< 1000	< 1000
THALLIUM, TOTAL	µg/L	< 2.0	< 2.0
ZINC, TOTAL	µg/L	< 20	< 20

## Notes

(1) Field Blank 1 collected after MW-109.

<sup>(1)</sup> Field Blank 2 collected after MW-207.

TABLE 5  
FOLKERTSMA REFUSE SITE  
QC SAMPLE RESULTS  
MARCH 2001

PARAMETER	UNITS	FIELD BLANK 1 3/12/2001 910688-006	FIELD BLANK 2 3/13/2001 910688-014	TRIP BLANK 1 3/13/2001 910688-015
1,1,1-TRICHLOROETHANE	µg/L	< 1.0	< 1.0	< 1.0
1,1,2,2-TETRACHLOROETHANE	µg/L	< 1.0	< 1.0	< 1.0
1,1,2-TRICHLOROETHANE	µg/L	< 1.0	< 1.0	< 1.0
1,1-DICHLOROETHANE	µg/L	< 1.0	< 1.0	< 1.0
1,1-DICHLOROETHENE	µg/L	< 1.0	< 1.0	< 1.0
1,2-DICHLOROETHANE	µg/L	< 1.0	< 1.0	< 1.0
1,2-DICHLOROETHENE, TOTAL	µg/L	< 2.0	< 2.0	< 2.0
1,2-DICHLOROPROPANE	µg/L	< 1.0	< 1.0	< 1.0
2-BUTANONE	µg/L	< 5.0	< 5.0	< 5.0
2-HEXANONE	µg/L	< 5.0	< 5.0	< 5.0
4-METHYL-2-PENTANONE	µg/L	< 5.0	< 5.0	< 5.0
ACETONE	µg/L	< 5.0	< 5.0	< 5.0
BENZENE	µg/L	< 1.0	< 1.0	< 1.0
BROMODICHLOROMETHANE	µg/L	< 1.0	< 1.0	< 1.0
BROMOFORM	µg/L	< 1.0	< 1.0	< 1.0
BROMOMETHANE	µg/L	< 2.0	< 2.0	< 2.0
CARBON DISULFIDE	µg/L	< 1.0	< 1.0	< 1.0
CARBON TETRACHLORIDE	µg/L	< 1.0	< 1.0	< 1.0
CHLOROBENZENE	µg/L	< 1.0	< 1.0	< 1.0
CHLORODIBROMOMETHANE	µg/L	< 1.0	< 1.0	< 1.0
CHLOROETHANE	µg/L	< 2.0	< 2.0	< 2.0
CHLOROFORM	µg/L	< 1.0	< 1.0	< 1.0
CHLOROMETHANE	µg/L	< 2.0	< 2.0	< 2.0
CIS-1,3-DICHLOROPROPENE	µg/L	< 1.0	< 1.0	< 1.0
ETHYLBENZENE	µg/L	< 1.0	< 1.0	< 1.0
METHYLENE CHLORIDE	µg/L	< 1.0	< 1.0	< 1.0
STYRENE	µg/L	< 1.0	< 1.0	< 1.0
TETRACHLOROETHENE	µg/L	< 1.0	< 1.0	< 1.0
TOLUENE	µg/L	< 1.0	< 1.0	< 1.0
TRANS-1,3-DICHLOROPROPENE	µg/L	< 1.0	< 1.0	< 1.0
TRICHLOROETHENE	µg/L	< 1.0	< 1.0	< 1.0
VINYL CHLORIDE	µg/L	< 2.0	< 2.0	< 2.0
XYLENE, TOTAL	µg/L	< 3.0	< 3.0	< 3.0

Notes

(1) Field Blank 1 collected after MW-109.

(1) Field Blank 2 collected after MW-207.

Table 1  
Folkertsma Refuse Site  
Groundwater and Surface Water Field Parameters  
April 2002

PARAMETER	UNITS	MW-201 <sup>(1)</sup> 4/29/2002 921359-008	MW-106 4/30/2002 921359-001	MW-107R 4/30/2002 921359-003	MW-108 4/29/2002 921359-005	MW-109 4/29/2002 921359-007	MW-206 4/30/2002 921359-002	MW-207R 4/30/2002 921359-004	MW-208 4/30/2002 921359-006	SW-1 4/29/2002 921359-009	SWBG-1 <sup>(1)</sup> 4/29/2002 921359-010
Color, field		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Conductance, specific	µmhos/cm	661	834	616	710	610	679	641	681	847	893
Depth to water	feet	8.67	5.34	7.16	5.14	12.53	5.94	7.26	5.27	NA	NA
Odor, field		None	None	None	None	None	None	None	None	None	None
Oxidation/Reduction potential	mV	48	-95	-74	-75	-1	-111	-46	-69	132	102
Oxygen, dissolved	mg/L	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1	NA	NA
pH, field	SU	7.13	6.97	7.17	7.25	7.28	7.28	7.25	7.11	7.4	7.55
Temperature	degrees C	10.9	9.3	10.8	10.0	10.00	10.9	8.9	8.4	12.8	11.5
Turbidity, field	NTU	2	2	2	4	2	6	10	1	NA	NA
Water elevation	feet M.S.L.	642.39	631.90	631.36	630.73	632.37	631.89	631.26	630.6	NA	NA

Notes:

<sup>(1)</sup> MW-201 and SWBG-1 are background monitoring points.

NA = not applicable.

Created By: C. Shaw 7/26/02

Checked By: K. Ketcher 8/8/02

**Table 2**  
**Folkertsma Refuse Site**  
**Groundwater and Surface Water Inorganic Parameter Results**  
**April 2002**

PARAMETER	UNITS	GENERIC GSI CRITERIA <sup>(1)</sup>	MW-201 4/29/2002 921359-008	MW-106 4/30/2002 921359-001	MW-107R 4/30/2002 921359-003	MW-108 4/29/2002 921359-005	MW-109 4/29/2002 921359-007	MW-109 DUP 4/29/2002 921359-011
Arsenic, total <sup>(2)</sup>	µg/L	150	< 20	< 20	< 20	< 20	< 20	< 20
Copper, total <sup>(2)</sup>	µg/L	27	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Lead, total <sup>(2)</sup>	µg/L	107	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Manganese, total <sup>(2)</sup>	µg/L	1079	28	69	32	< 20	< 20	< 20
Mercury, total <sup>(2)</sup>	µg/L	0.2 <sup>(3)</sup>	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Nickel, total <sup>(2)</sup>	µg/L	239	< 25	< 25	< 25	< 25	< 25	< 25
Selenium, total <sup>(2)</sup>	µg/L	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Silver, total <sup>(2)</sup>	µg/L	0.2 <sup>(3)</sup>	< 0.20 <sup>(4)</sup>	< 0.20 <sup>(4)</sup>	< 0.20 <sup>(4)</sup>	< 0.20 <sup>(4)</sup>	< 0.20 <sup>(4)</sup>	< 0.20 <sup>(4)</sup>
Zinc, total <sup>(2)</sup>	µg/L	493	< 20	< 20	< 20	< 20	< 20	< 20

Notes:

- <sup>(1)</sup> Reference date for generic GSI criteria is June 7, 2000. For hardness-dependent GSI criteria, a hardness of 225 mg/L CaCO<sub>3</sub> for Indian Mill Creek in Kent County was used, as directed by Jack Wuycheck, MDEQ. The Rule 57 Water Quality Values are the applicable criteria for surface water. For the constituents of interest at this site, the generic GSI criteria are the lowest of the relevant Rule 57 criteria (February 1, 2001).
- <sup>(2)</sup> Except as noted, the detection limits are the Contract Required Detection Limits from the USEPA-approved 1993 QAPP.
- <sup>(3)</sup> Generic GSI criterion is less than the analytical Method Detection Limit (MDL) of 0.2 µg/L; therefore, the GSI criterion defaults to the MDL. The target detection limit for mercury and silver is 0.2 µg/L, as stated in the April 2001 OM&M plan.
- <sup>(4)</sup> Contract required detection limit (applicable to April 2002 sampling event) is 10 µg/L. Lower detection limit was reported by the laboratory.

Created By: C. Shaw 7/26/02

Checked By: K. Ketcher 8/8/02

## - Analytical Report -

Project Name : FOLKERTSMA RS  
Project Number : 5331.10  
Field ID : MW-106  
Lab Sample Number : 921359-001  
Lab Project Number : 921359

Submitter : RMT - MADISON  
Report Date : 5/21/02  
Collection Date : 4/30/02  
Matrix Type : WATER  
WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	69	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

**- Analytical Report -**

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : MW-206

Collection Date : 4/30/02

Lab Sample Number : 921359-002

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

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**Inorganic Results**

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	43	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020



## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : MW-107R

Collection Date : 4/30/02

Lab Sample Number : 921359-003

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	32	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : MW-207R

Collection Date : 4/30/02

Lab Sample Number : 921359-004

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

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### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	210	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : MW-108

Collection Date : 4/29/02

Lab Sample Number : 921359-005

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : MW-208

Collection Date : 4/30/02

Lab Sample Number : 921359-006

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	150	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : MW-109

Collection Date : 4/29/02

Lab Sample Number : 921359-007

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

**- Analytical Report -**

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : MW-201

Collection Date : 4/29/02

Lab Sample Number : 921359-008

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

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**Inorganic Results**

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	28	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : SW-1

Collection Date : 4/29/02

Lab Sample Number : 921359-009

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	28	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : SWBG-1

Collection Date : 4/29/02

Lab Sample Number : 921359-010

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	22	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020



## - Analytical Report -

Project Name : FOLKERTSMA RS  
Project Number : 5331.10  
Field ID : DUP-01  
Lab Sample Number : 921359-011  
Lab Project Number : 921359

Submitter : RMT - MADISON  
Report Date : 5/21/02  
Collection Date : 4/29/02  
Matrix Type : WATER  
WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : DUP-02

Collection Date : 4/30/02

Lab Sample Number : 921359-012

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	49	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

## - Analytical Report -

Project Name : FOLKERTSMA RS  
Project Number : 5331.10  
Field ID : FB-01  
Lab Sample Number : 921359-013  
Lab Project Number : 921359

Submitter : RMT - MADISON  
Report Date : 5/21/02  
Collection Date : 4/29/02  
Matrix Type : WATER  
WI DNR LAB ID : 113172950

### Inorganic Results

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

**- Analytical Report -**

Project Name : FOLKERTSMA RS

Submitter : RMT - MADISON

Project Number : 5331.10

Report Date : 5/21/02

Field ID : FB-02

Collection Date : 4/30/02

Lab Sample Number : 921359-014

Matrix Type : WATER

Lab Project Number : 921359

WI DNR LAB ID : 113172950

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**Inorganic Results**

Test	Result	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method
Arsenic	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Copper	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Lead	< 3.0	3.0	ug/L		5/7/02	SW846 3015	SW846 6020
Manganese	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020
Mercury	< 0.20	0.20	ug/L		5/7/02	SW846 7470A	SW846 7470A
Nickel	< 25	25	ug/L		5/7/02	SW846 3015	SW846 6020
Selenium	< 5.0	5.0	ug/L		5/7/02	SW846 3015	SW846 6020
Silver	< 0.20	0.20	ug/L		5/7/02	SW846 3015	SW846 6020
Zinc	< 20	20	ug/L		5/7/02	SW846 3015	SW846 6020

# **Appendix B**

## **Post-Closure Landfill Gas**

## **Monitoring Results**

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**Table B-1**  
**Landfill Gas Monitoring Results**  
**Folkertsma Refuse Site, Walker, Michigan**  
**May 2003**

GAS PROBE	COMBUSTIBLE GAS (% LEL)	%V/V			PRESSURE (in. WC)
		CH <sub>4</sub>	CO <sub>2</sub>	O <sub>2</sub>	
GP1	0.0	0.0	3.0	6.8	0
GP2	0.0	0.0	13.0	2.4	0
GP3	0.0	0.0	0.6	18.0	0

Monitored by: J. Overvoorde  
Date: 5/9/2003  
Temperature: 70° F  
Barometric Pressure: 29.74 inches, steady  
Checked by: G. Schultz  
Date: 6/5/2003

**Table B-2**  
**Landfill Gas Monitoring Results**  
**Folkertsma Refuse Site, Walker, Michigan**  
**October, 2003**

GAS PROBE	COMBUSTIBLE GAS (% LEL)	%V/V			PRESSURE (in. WC)
		CH <sub>4</sub>	CO <sub>2</sub>	O <sub>2</sub>	
GP1	0.0	0.0	6.7	5.7	0
GP2	0.0	0.0	0.8	19.6	0
GP3	0.0	0.0	1.4	19.1	0

**Notes:**

Protective casings around GP1 and GP2 need to be replaced.

Monitored by: J. Overvoorde  
Date: 10/10/2003  
Temperature: 57° F  
Conditions: Clear, sunny, mild, still  
Barometric Pressure: 30.14 inches and steady  
Checked by: G. Schultz  
Date: 10/27/2003

**Table B-3**  
**Cumulative Gas Monitoring Results**  
**Folkertsma Refuse Site, Walker Michigan**

DATE	GP1		GP2 <sup>(a)</sup>		GP3	
	% LEL <sup>(1)</sup>	% METHANE	% LEL	% METHANE	%LEL	%METHANE
12/19/94	0	0	12	0.6	35	1.75
12/19/94	0	0	70	3.5	37	1.85
1/31/95	3	0.15	>100	>5	22	1.1
2/15/95	2	0.1	19	0.95	2	0.1
3/16/95	2	0.1	16	0.8	26	1.3
4/25/95	0	0	100	5	0	0
5/18/95	1	0.05	87	4.35	1	0.05
6/15/95	1	0.05	2	0.1	2	0.1
9/26/95	0	0	6	0.3	8	0.4
12/19/95	0	0	85	4.25	0	0
3/27/96	1	0.05	0	0	1	0.05
6/20/96	0	0	5	0.25	<1.0	<0.05
9/25/96	0	0	1	0.05	0	0
12/30/96	0	0	0	0	0	0
3/31/97	0	0	0	0	0	0
6/30/97	0	0	0	0	0	0
9/29/97	0	0	100	5	0	0
12/22/97	0	0	0	0	0	0
3/23/98	0	0	0	0	0	0
6/25/98	0	0	0	0	0	0
9/23/98	2	0.1	1	0.05	2	0.1
12/28/98	0	0	7	0.35	0	0
3/23/99	1	0.05	1	0.05	0	0
6/14/99	0	0	73	3.65	0	0
9/14/99	0	0	0	0	0	0
5/22/00	0	0	24	1.2	0	0
8/23/00	0	0	14	0.7	0	0



**Table B-3 (continued)**  
**Cumulative Gas Monitoring Results**  
**Folkertsma Refuse Site, Walker Michigan**

DATE	GP1		GP2 <sup>(2)</sup>		GP3	
	% LEL <sup>(1)</sup>	% METHANE	% LEL	% METHANE	%LEL	%METHANE
10/10/00	0	0	0-1	0	0	0
12/28/00	0	0	0	0	0	0
3/13/01	0	0	118	5.9	0	0
6/13/01	0	0	0	0	0	0
9/24/01	0	0	0	0	0	0
4/29/02	0	0	0	0	0	0
9/26/02	0	0	—	—	0	0
1/24/03	0	0	0	0	0	0
5/9/03	0	0	0	0	0	0
10/10/03	0	0	0	0	0	0

Notes:

(1) LEL denotes Lower Explosive Limit.

(2) — denotes that GP2 could not be monitored or inspected during this monitoring event because of the piles of wood and pallets surrounding the probe.

By: J. Overvoorde

Checked By: G. Schultz

# **Appendix C**

## **Groundwater and Surface Water Field and Analytical Results, and Data Validation Reports**

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### **Table of Contents**

- April/May 2003 Field and Laboratory Results
- April/May 2003 Data Validation Report

## **April/May 2003 Field and Laboratory Results**

**Table C-1**  
**Groundwater and Surface Water Field Parameters**  
**Folkertsma Refuse Site**  
**April/May 2003**

PARAMETER	UNITS	BG MW-201 <sup>(1)</sup> 5/1/2003 833902-013	MW-106 4/30/2003 833902-003	MW-107R 4/30/2003 833902-004	MW-108 4/30/2003 833902-007	MW-109 5/1/2003 833902-011	MW-206 4/30/2003 833902-001	MW-207R 4/30/2003 833902-005	MW-208 4/30/2003 833902-008	SW-1 4/30/2003 833902-009	SWBG-1 <sup>(1)</sup> 4/30/2003 833902-006
Color, field		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Cloudy	Cloudy
Conductance, specific	µmhos/cm	651	999	597	705	637	732	609	724	782	708
Depth to water	feet	9.58	5.60	7.40	5.48	12.86	6.18	7.50	5.58	NA	NA
Odor, field		None	None	None	None	None	None	None	None	None	None
Oxidation/Reduction potential	mv	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Oxygen, dissolved	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NA	NA
pH, field	su	7.32	7.32	7.51	7.56	7.28	7.53	7.52	7.42	7.86	7.77
Temperature	deg C	11.23	8.63	10.49	10.30	10.02	10.87	8.47	8.10	13.35	14.12
Turbidity, field	NTU	2.5	1	3	1.5	1	1.1	3	1.2	76	10
Water elevation	feet	641.48	631.64	631.12	630.39	632.04	631.65	631.02	630.29	NA	NA

**Footnote:**

<sup>(1)</sup> MW-201 and SWBG-1 are background monitoring points.

**Notes:**

NM = not measured. Parameters were inadvertently not measured but are estimated between 0.2 and 0.4 ppm, based on total iron values.

NA = not applicable.

Created By: C. Shaw 6/3/2003

Checked By: G. Perugini 6/4/2003

**Table C-2 (continued)**  
**Groundwater and Surface Water Inorganic Parameter Results**  
**Folkertsma Refuse Site**  
**April/May 2003**

PARAMETER	UNITS	GENERIC GSI CRITERIA <sup>(1)</sup>	MW-207R 4/30/2003 833902-005	MW-208 4/30/2003 833902-008	SW-1 4/30/2003 833902-009	SWBG-1 4/30/2003 833902-006
Aluminum, total <sup>(2)</sup>	µg/L	NA	< 50	< 50	110	99
Barium, total <sup>(2)</sup>	µg/L	1037	230	120	< 100	< 100
Chromium, total <sup>(2)</sup>	µg/L	216 <sup>(3)</sup>	< 5.0	< 5.0	< 5.0	< 5.0
Copper, total <sup>(2)</sup>	µg/L	27	< 5.0	< 5.0	6.1	10.0
Iron, total <sup>(2)</sup>	µg/L	NA	900	710	490	380
Lead, total <sup>(2)</sup>	µg/L	107	< 3.0	< 3.0	< 3.0	< 3.0
Magnesium, total <sup>(2)</sup>	µg/L	NA	34,000	39,000	33,000	27,000
Manganese, total <sup>(2)</sup>	µg/L	1079	140	160	38	37
Potassium, total <sup>(2)</sup>	µg/L	NA	1,300	3,300	3400	3,100
Silver, total <sup>(2)</sup>	µg/L	0.2 <sup>(3)</sup>	< 0.20 <sup>(4)</sup>	< 0.20 <sup>(4)</sup>	< 0.40 <sup>(4)</sup>	< 0.41 <sup>(4)</sup>
Sodium, total <sup>(2)</sup>	µg/L	NA	14,000	17,000	42,000	39,000
Thallium, total <sup>(2)</sup>	µg/L	4	< 2.0	< 2.0	< 2.0	< 2.0
Zinc, total <sup>(2)</sup>	µg/L	493	23	< 20	49	46

**Footnotes:**

- <sup>(1)</sup> Reference date for generic GSI criteria is June 7, 2000. For hardness-dependent GSI criteria, a hardness of 225 mg/L CaCO<sub>3</sub> for Indian Mill Creek in Kent County was used, as directed by Jack Wuycheck, MDEQ. The Rule 57 Water Quality Values are the applicable criteria for surface water. For the constituents of interest at this site, the generic GSI criteria are the lowest of the relevant Rule 57 criteria (February 1, 2001).
- <sup>(2)</sup> Except as noted, the detection limits are the Contract Required Detection Limits from the USEPA-approved 1993 QAPP.
- <sup>(3)</sup> Generic GSI criterion are less than the analytical Method Detection Limit (MDL) of 0.2 µg/L, and therefore default to the MDL. The target detection limit for mercury and silver is 0.2 µg/L, as stated in the April 2001 OM&M Plan.
- <sup>(4)</sup> Contract-required detection limit (applicable to April 2003 sampling event) is 10 µg/L. Lower detection limit was reported by the laboratory.

**Notes:**

N = sample spike recovery not within control limits. (Recoveries were slightly high, indicating a potential high bias. There is no effect on data because all analytes, except for sodium, were not detected. The sodium value reported agrees with historical values reported in previous reports.)

NA = not available.

Created By: C. Shaw 6/3/2003

Checked By: G. Perugini 6/4/2003

**Table C-3**  
**QC Sample Inorganic Parameter Results**  
**Folkertsma Refuse Site**  
**April/May 2003**

PARAMETER	UNITS	FIELD BLANK 1	FIELD BLANK 2
		9/25/2002 826305-009	9/26/2002 826305-010
Aluminum, total	µg/L	< 50	< 50
Barium, total	µg/L	< 100	< 100
Chromium, total	µg/L	< 5.0	< 5.0
Copper, total	µg/L	< 5.0	< 5.0
Iron, total	µg/L	< 100	110
Lead, total	µg/L	< 3.0	< 3.0
Magnesium, total	µg/L	28,000	28,000
Manganese, total	µg/L	< 20	< 20
Potassium, total	µg/L	1,000	1,000
Silver, total	µg/L	< 0.20	< 0.20
Sodium, total	µg/L	9,000	9,100
Thallium, total	µg/L	< 2.0	< 2.0
Zinc, total	µg/L	< 20	< 20

**Notes:**

1. Field Blank 1 collected after SW-1.
2. Field Blank 2 collected after MW-201.

Created By: C. Shaw 6/3/2003

Checked By: G. Perugini 6/4/2003